Enabling Ring-Cusp Ion Thruster Technology for NASA Missions

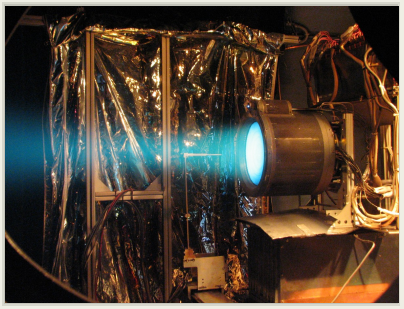
Completed Technology Project (2015 - 2017)

Project Introduction

ESA is flying T6 Kaufman ion thrusters on the BepiColombo Mission to Mercury in 2018. They are planning to develop a longer life, higher performing, 30-cm ring-cusp ion thruster similar to that flying on the Dawn mission. ESA approached Dan Goebel, a leading authority on electric thrusters and the author of the JPL book on electric propulsion with Ira Katz, for help in designing and ultimately testing this new thruster. A collaboration between ESA, its contractors in the UK, and JPL has been underway for over a year now to design and build the first European ring-cusp thruster. The ESA/JPL team intends to make a thruster that can satisfy science mission propulsion needs for Discovery-class missions in both Europe and the US. NASA is supporting the JPL efforts through its Center Innovative Fund program managed by STMC and the Chief Technologist Office at JPL. Dr. Goebel provides input on the thruster parameters desirable for NASA deep space missions, and provides modeling validation and guidance to ESA and its contractors on the thruster design, performs carbon-carbon grid optics modeling, and produces life predictions for the new grids and larger cathodes (compared to the QinetiQ T6 thruster). Once an engineering model of the ion thruster is built by QinetiQ or other ESA contractors, Goebel plans to do validation testing at JPL to ensure that the thruster meets NASA needs. JPL would then procure this thruster as a commercial product for use on our missions, in much the same way that it procures other instruments and spacecraft components from European vendors. Europe gets a more advanced ion thruster, and JPL/NASA gets another commercial vendor of high-tech space components.

Anticipated Benefits

Applications: EP thrusters for competed mission concepts; Discovery Missions; New Frontiers Missions; potential Flagship EP missions. Follow-On Options: Additional development at JPL (funded by ESA and/or NASA); Performance testing and evaluation with beam extraction; EM thruster development; EM thruster environmental testing.



T6_ion_thruster_firing at JPL.

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Center Innovation Fund: JPL CIF

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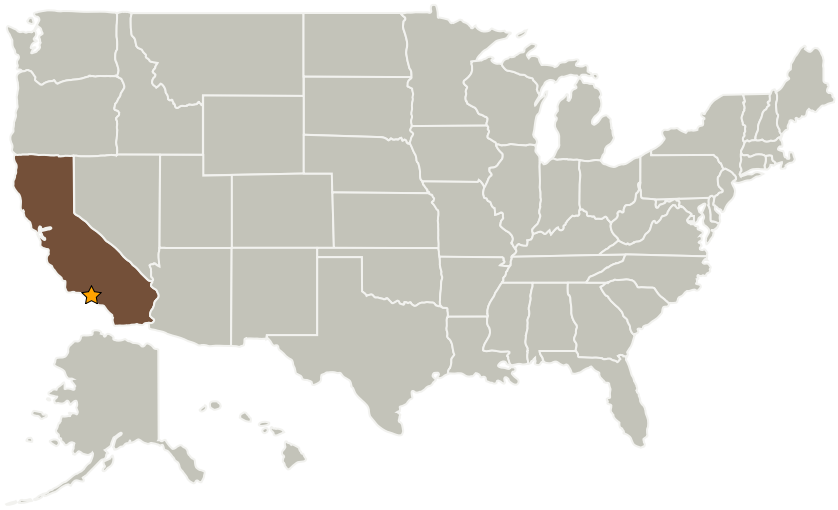
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Co-Funding Partners	Type	Location
European Space Agency(ESA)	International	Paris, Outside the United States, France

Primary U.S. Work Locations
California

Project Management

Program Director:
Michael R Lapointe

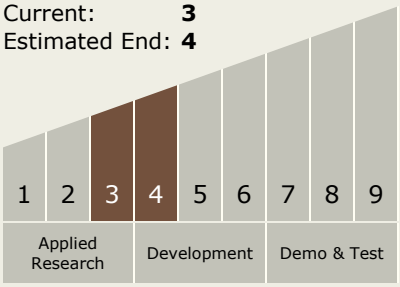
Program Manager:
Fred Y Hadaegh

Principal Investigator:
Dan M Goebel

Co-Investigator:
Steve Snyder

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**

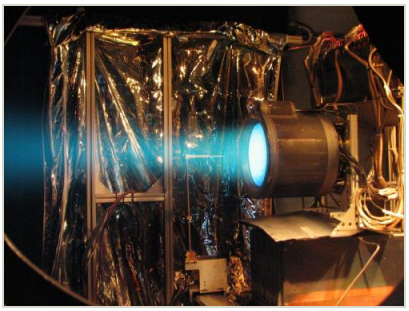


Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.2 Electrostatic

Images



JPL_IRAD_Activities Project Image
T6_ion_thruster_firing at JPL.
(https://techport.nasa.gov/image/27908)

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html